

# **Exhibit 1**

## pKa's of Inorganic and Oxo-Acids

Chem 206

Substrate	pKa	H <sub>2</sub> O (DMSO)	Substrate	pKa	H <sub>2</sub> O (DMSO)	Substrate	pKa	H <sub>2</sub> O (DMSO)	Substrate	pKa	H <sub>2</sub> O (DMSO)
<b>INORGANIC ACIDS</b>			<b>CARBOXYLIC ACIDS</b>			<b>ALCOHOLS</b>			<b>PROTONATED SPECIES</b>		
H <sub>2</sub> O*	15.7	(32)	X-COOH			HOH	15.7	(31.2)	Ph-N <sup>+</sup> (OH) <sub>2</sub>		-12.4
H <sub>3</sub> O <sup>+</sup>	-1.7		X=CH <sub>3</sub>	4.76	(12.3)	MeOH	15.5	(27.9)	Ph-CH <sub>2</sub> -OH		-7.8
H <sub>2</sub> S	7.00		CH <sub>2</sub> NO <sub>2</sub>	1.68		i-PrOH	16.5	(29.3)	Ph-CH(OH)-CH <sub>3</sub>		-6.2
HBr	-9.00	(0.9)	CH <sub>2</sub> F	2.66		t-BuOH	17.0	(29.4)	Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		-6.5
HCl	-8.0	(1.8)	CH <sub>2</sub> Cl	2.86		α-hex <sub>3</sub> COH	24.0		Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		-3.8
HF	3.17	(15)	CH <sub>2</sub> Br	2.86		CF <sub>3</sub> CH <sub>2</sub> OH	12.5	(23.5)	Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		-2.05
HOCl	7.5		CH <sub>2</sub> I	3.12		(CF <sub>3</sub> ) <sub>2</sub> CHOH	9.3	(18.2)	Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		-2.2
HClO <sub>4</sub>	-10		CHCl <sub>2</sub>	1.29		C <sub>6</sub> H <sub>5</sub> OH	9.95	(18.0)	Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		-1.8
HCN	9.4	(12.9)	CCl <sub>3</sub>	0.65		m-O <sub>2</sub> NC <sub>6</sub> H <sub>4</sub> OH	8.4		Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		0.79 (+1.63)
HN <sub>3</sub>	4.72	(7.9)	CF <sub>3</sub>	-0.25		p-O <sub>2</sub> NC <sub>6</sub> H <sub>4</sub> OH	7.1	(10.8)	Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		(+5.55)
HSCN	4.00		H	3.77		p-OMeC <sub>6</sub> H <sub>4</sub> OH	10.2	(19.1)	Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		-2.6
H <sub>2</sub> SO <sub>3</sub>	1.9, 7.21		HO	3.6, 10.3		2-naphthol		(17.1)	Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		2.1
H <sub>2</sub> SO <sub>4</sub>	-3.0, 1.99		C <sub>6</sub> H <sub>5</sub>	4.2	(11.1)	<b>OXIMES &amp; HYDROXAMIC ACIDS</b>					
H <sub>3</sub> PO <sub>4</sub>	2.12, 7.21, 12.32		α-O <sub>2</sub> NC <sub>6</sub> H <sub>4</sub>	2.17		Ph-N=O	11.3	(20.1)	Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		
HNO <sub>3</sub>	-1.3		m-O <sub>2</sub> NC <sub>6</sub> H <sub>4</sub>	2.45		Ph-C(=O)-N=O	8.88	(13.7) (NH)	Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		
HNO <sub>2</sub>	3.29		p-O <sub>2</sub> NC <sub>6</sub> H <sub>4</sub>	3.44		Ph-C(=O)-N=O		(18.5)	Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		
H <sub>2</sub> CrO <sub>4</sub>	-0.98, 6.50		o-ClC <sub>6</sub> H <sub>4</sub>	2.94		Ph-C(=O)-N=O			Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		
CH <sub>3</sub> SO <sub>3</sub> H	-2.6 (1.6)		m-ClC <sub>6</sub> H <sub>4</sub>	3.83		Ph-C(=O)-N=O			Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		
CF <sub>3</sub> SO <sub>3</sub> H	-14 (0.3)		p-ClC <sub>6</sub> H <sub>4</sub>	3.99		Ph-C(=O)-N=O			Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		
NH <sub>4</sub> Cl	9.24		α-(CH <sub>3</sub> ) <sub>3</sub> N <sup>+</sup> C <sub>6</sub> H <sub>4</sub>	1.37		Ph-C(=O)-N=O			Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		
B(OH) <sub>3</sub>	9.23		p-(CH <sub>3</sub> ) <sub>3</sub> N <sup>+</sup> C <sub>6</sub> H <sub>4</sub>	3.43		Ph-C(=O)-N=O			Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		
HOOH	11.6		p-OMeC <sub>6</sub> H <sub>4</sub>	4.47		Ph-C(=O)-N=O			Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		
			R-COOH			<b>PEROXIDES</b>					
			R=H	4.25		MeOOH	11.5		Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		
			trans-CO <sub>2</sub> H	3.02, 4.38		CH <sub>3</sub> CO <sub>3</sub> H	8.2		Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		
			cis-CO <sub>2</sub> H	1.92, 6.23					Ph-CH(OH)-CH <sub>2</sub> CH <sub>3</sub>		

\*Values <0 for H<sub>2</sub>O and DMSO, and values >14 for water and >35 for DMSO were extrapolated using various methods.For a comprehensive compilation of Bordwell pKa data see: <http://www.chem.wisc.edu/areas/reich/pkatable/index.htm>